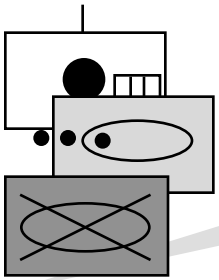

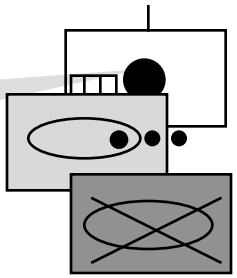

Automating The Command Decision Process

Background and Utilization of AI Techniques for Behavioral Modeling

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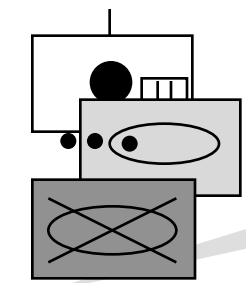
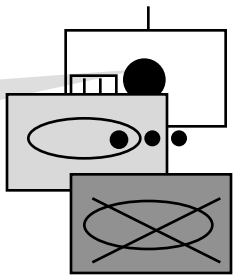
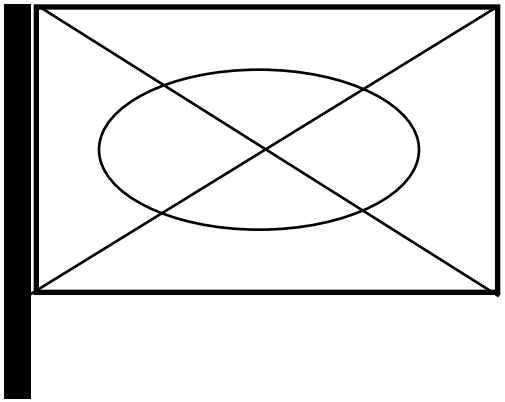
Presented by Sheila L. Jaszlics
Pathfinder Systems, Inc.
February 27-28, 1996

The Goal







Training Process:
Improves
Readiness

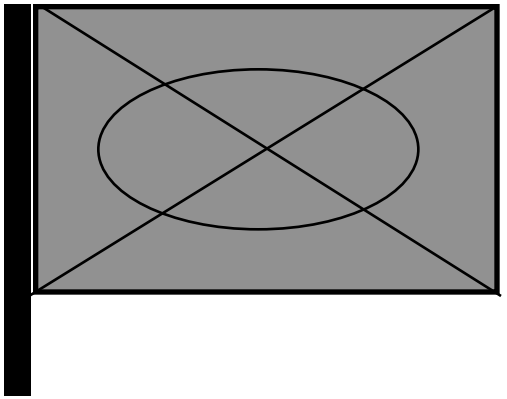
Military Ops Simulations

Other Systems

Other Systems

Other Assets

Other Assets



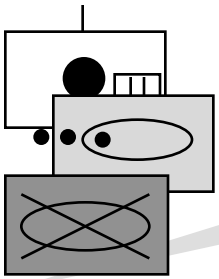
Training Audience

Training Audience

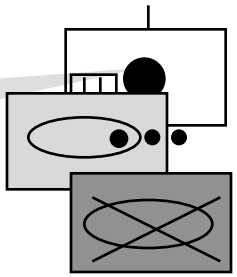
Initial State of Readiness

Time

Higher State Of Readiness



The Solution

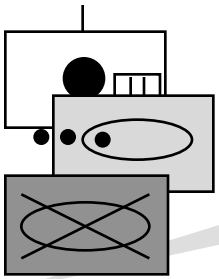


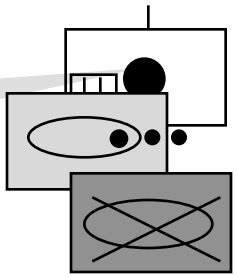
Delivered *information, of the right content & scope, in the right hands at the right time...*

- Dynamic - Can accommodate changes in terms of content and format to suit the situation
- Accessible - changing forces structures and info. needs
- Capture the ESSENTIAL information - More isn't necessarily better and the "Readers Digest" version isn't always enough
- Distributed data and redundant communications are key
- Transparent - Training audience is unaware of simulation

Constructed wi;th minimum role player supervision by automating the command process

Command Decision Process Defined





STAFF ACTIONS

MISSION RECEIVED

CMDR'S ACTIONS

INFO. TO COMMANDER

INFO. TO STAFF

STAFF ESTIMATES

MISSION ANALYSIS, RESTATED MISSION, CMDR'S PLANNING GUIDANCE

CMDR'S ESTIMATE/DECISION

CMDR'S CONCEPT

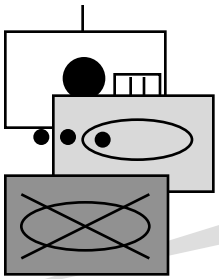
PREPARATIONS OF PLANS/ORDERS

ISSUANCE OF PLANS/ORDERS

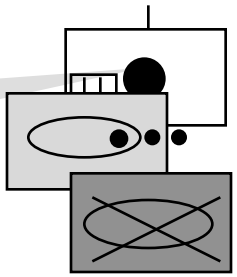
APPROVAL OF PLANS/ORDERS

SUPERVISION

MISSION ACCOMPLISHED



Command Decision Process In Practice



Receive Information & Orders (Situation Awareness)

Communicating Information & Orders

Learning, (Adapt, Improvise, Overcome

Comparing (Quick Analysis of Options)

Battle Command

the art of battle decisionmaking, leading and motivating soldiers and units into action, including visualizing current state and future state, then formulating concepts of operations to get from one to the other at the least cost

Deciding (Rapid Decisionmaking)

Planning (Rapid Decisionmaking and Orders Issue

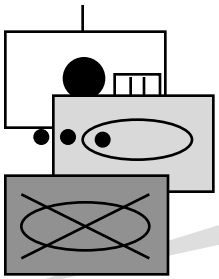
Leading (Forward Command)

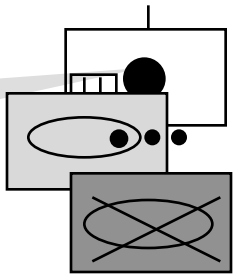
Evaluating (Asses Situation Awareness)

Tasking (Task & Purpose)

Battle command involves myriad tasks with no determined pattern or structured sequence.

Generalized C2 Model





External Environment and Enemy Forces

Mission Plans and Dynamic Re-Plan

Commands

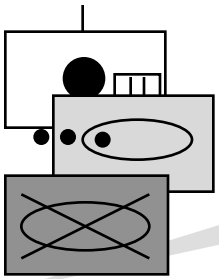
Mission Dynamics (Real World or Simulation)

Actual Situation

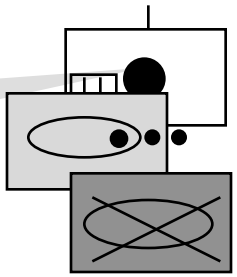
Intel

Current Situation

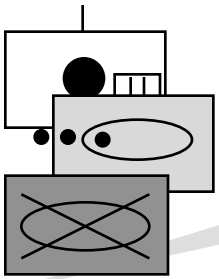
Decision Generation



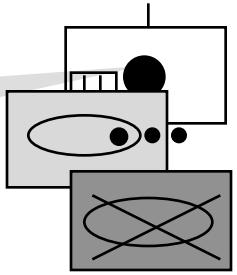
Representation Issues



- The Mission is an input into the Decision
- Doctrine and “Corporate Knowledge”reside in the Decision Structure
- Decision Structures work from *Perception* of Situation
  - Physical Environment and Limitations
  - Other Decision Structure Feeds



Decision Structure



The INPUT data structure is a dynamic Attribute of this Object. It reflects the state of those variables that may affect the generation of its OUTPUT. It may change over time as learning proceeds

DECISION STRUCTURE is a re-usable Object,which can represent human behavior in reaching a decision, based on its general KNOWLEDGE and its current INPUT.

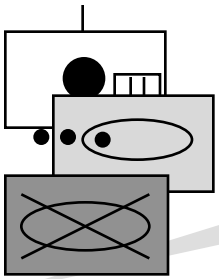
The OUTPUT data structure has a single best selection, and a ranked list of other reasonable selections for each of one or more output lists, which may change over time as learning proceeds

The KNOWLEDGE attribute of this object is a data structure consisting of a Structural Description, learned Behavior, and Learning Constraints.

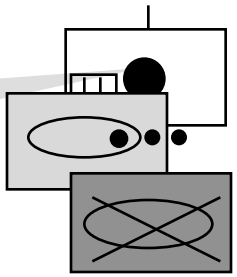
COGNITIVE FUNCTIONS associated with this object obtain the OUTPUT by processing the input and the KNOWLEDGE.

EVENTS sensed by this object will trigger the execution of its FUNCTIONS.

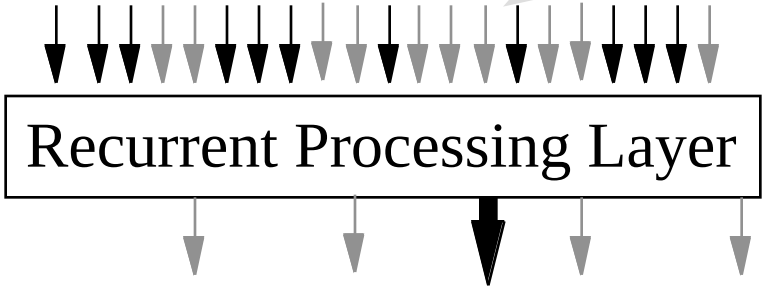
LEARNING is not a part of the Decision Structure Object. It is a process, which modifies the KNOWLEDGE used by he Secession Structure. We postulate that it should use Direct Knowledge Transfer, that is, it should learn from examples.

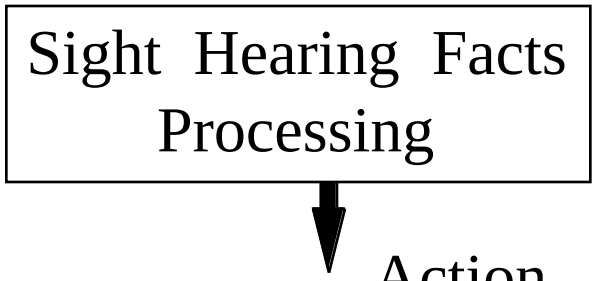


Decision Structure Networks



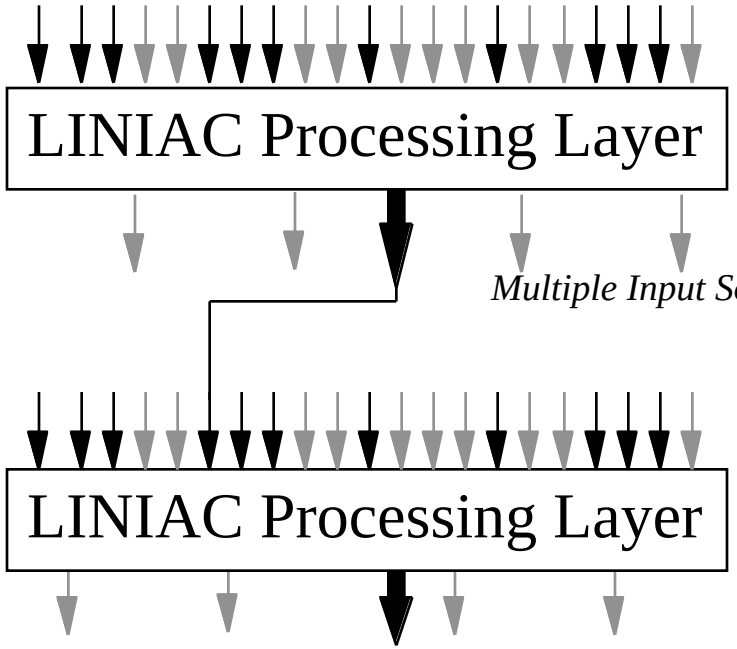
1.



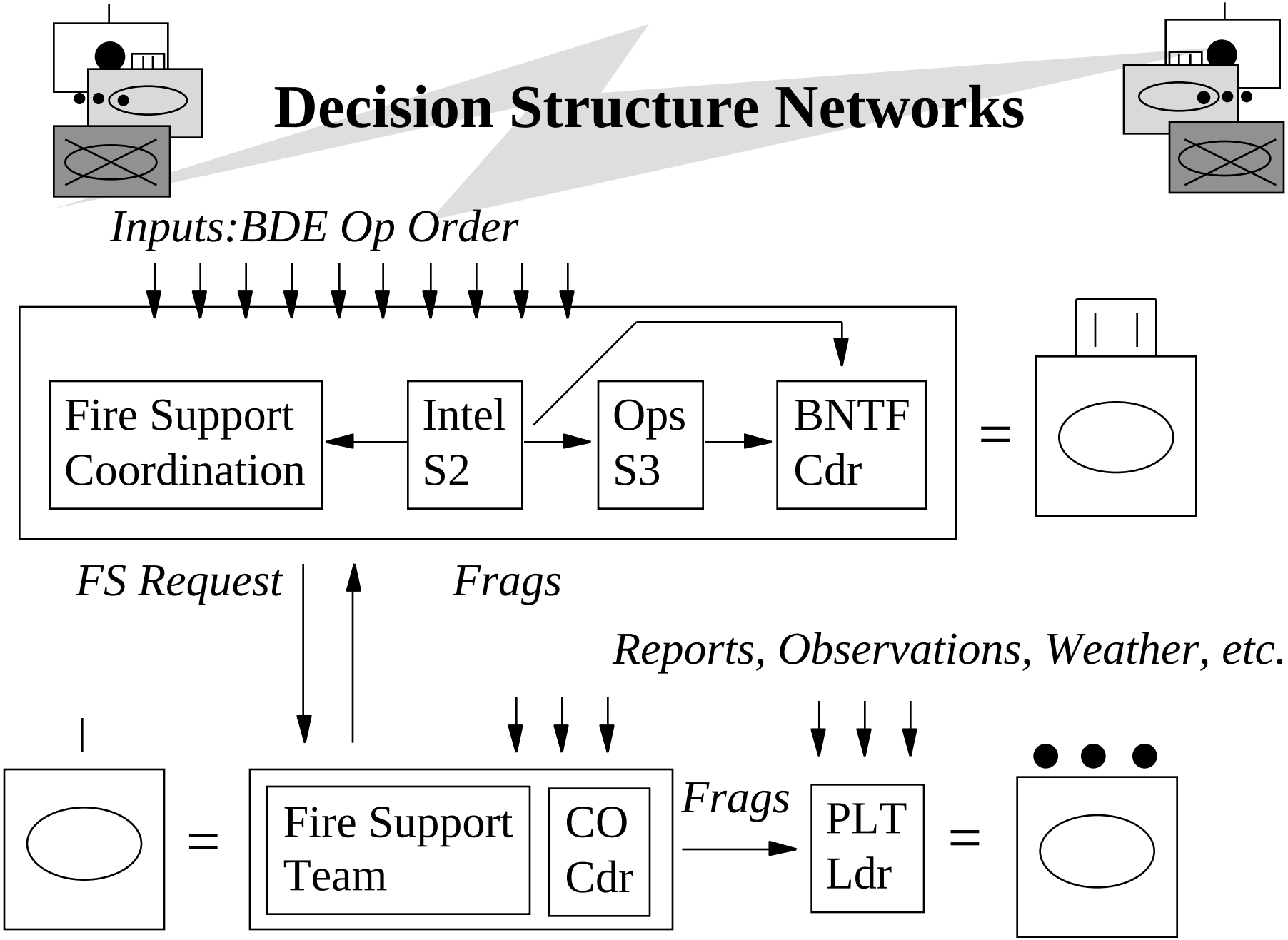


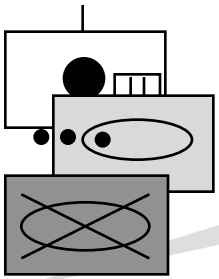
2.

Inputs May Include Output of Lower Layers

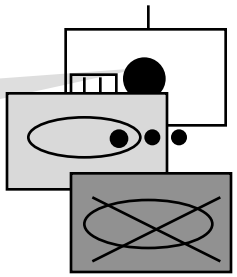


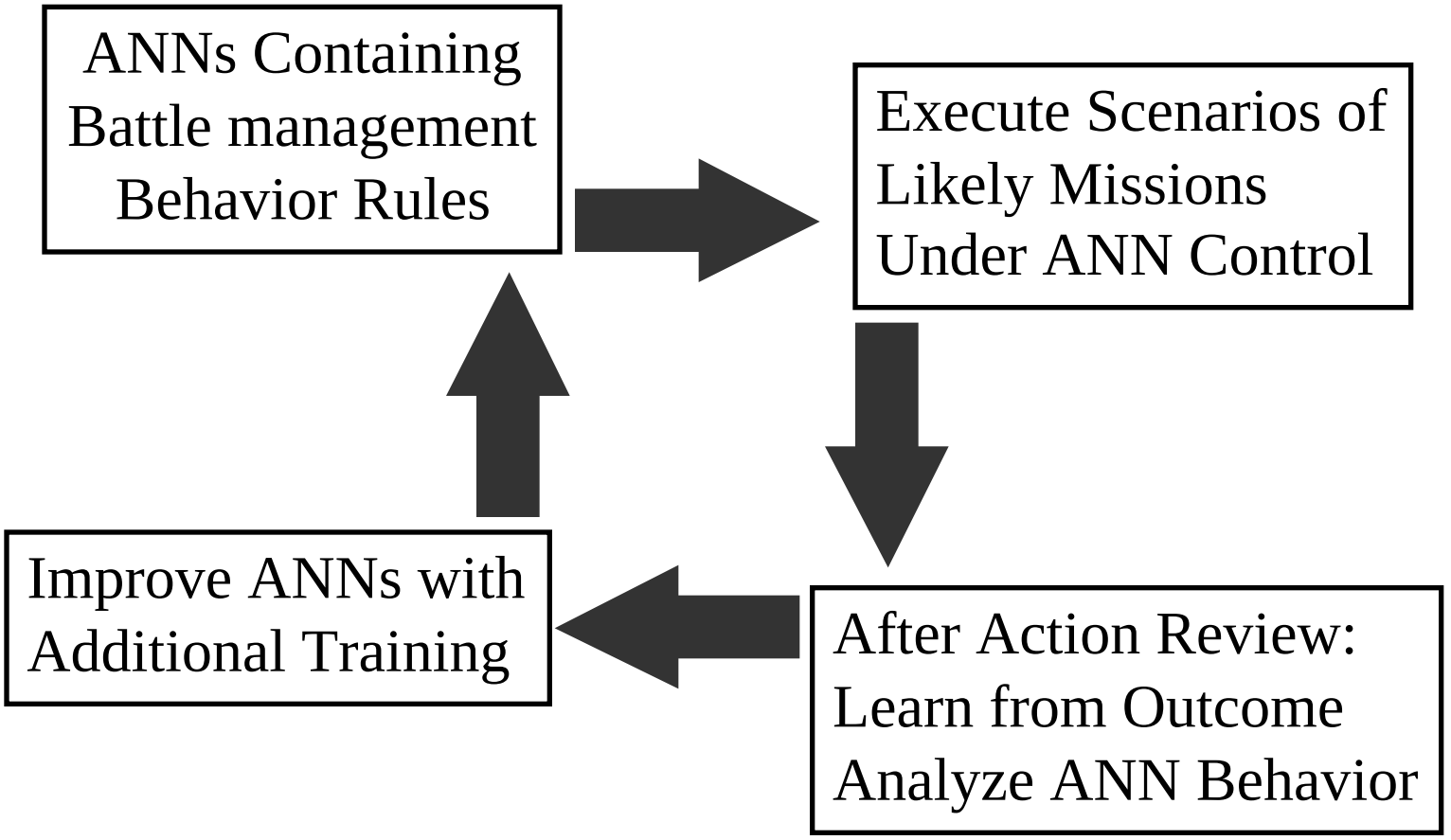
Decision Structure Networks



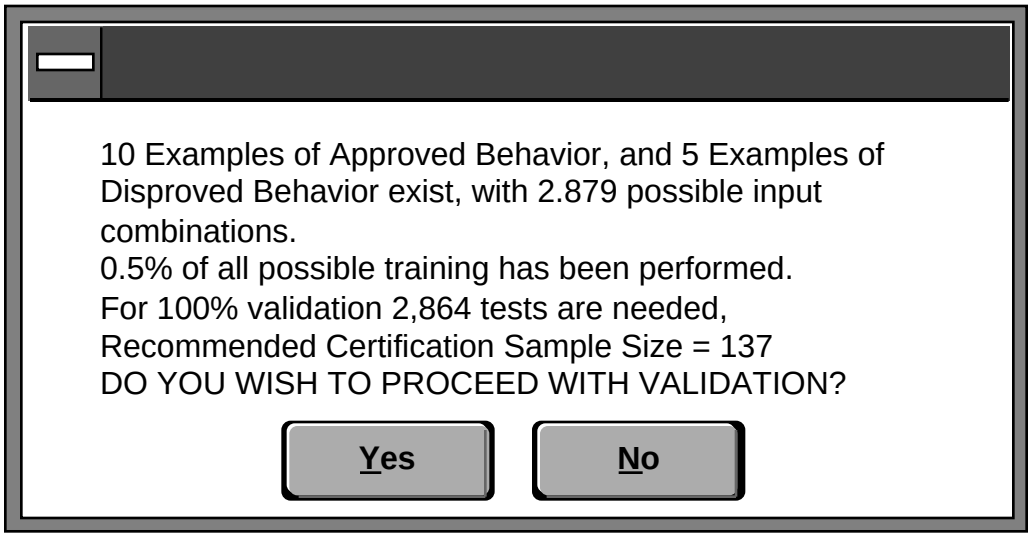


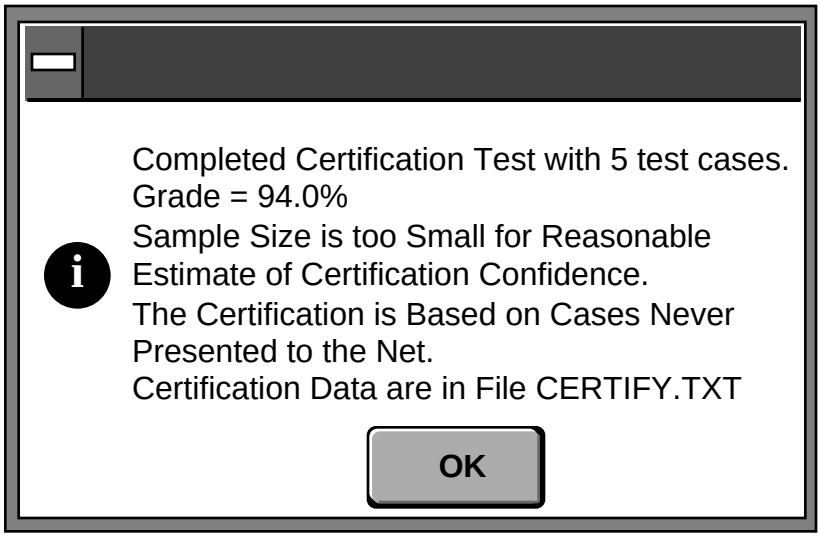
Direct Knowledge Transfer





Validation Process

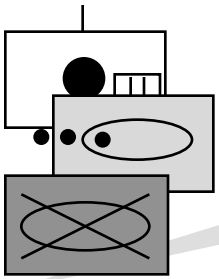




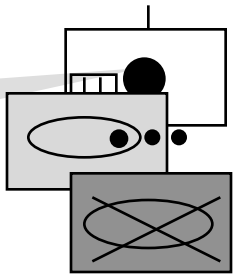
CERTIFICATION RECORD FOR ANN FILE GRNDX11B.LTF
03-28-1995 11:38:16 - Problem Name: Small Unit Defense - Certification Based on Cased Never Presented to the Net.

Case	SitOnFlanks/ OwnLoss/LossRatio	own/ene/ForcRatio	o/e/ Logistics/	Revg'DirFire/	Results/ Score
00001	Secure/Medium	High/	Equal/	Ambr/	Yes/CountAtt/ 7
00002	Open/Medium	High/	Equal/	Ambr/	No/ControlDef/ 10
00003	Open/High	High/	Low/	No Input/	No/ BrkCon/ 10
00004	NbrFwd/Medium	High/	High/	Green	Yes/CountAtt/ 10
00005	NoInput/NoInput	Low/	Low/	No Input	No ContDef/ 10

Overall Score = 94.0% Sample Size in too Small for Reasonable Estimate of Certification Confidence.



ANN Benefits & Drawbacks

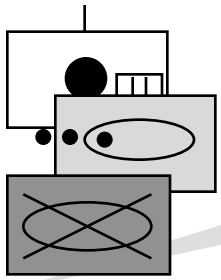


Benefits:

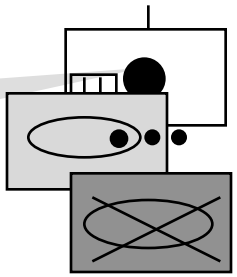
- Minimal Storage Required - Computationally Efficient
- Easy to Implement and Integrate / Populate and Train

Potential Drawbacks:

- Take on Trainer's Personality
- Use Needs to be Supervised
- Demands Strict Variable Definition & Control



Further Research



Training Issues:

- Critical Live Links
- Eliminating the Role Player Training Benefit

Technology Issues:

- Use Decision Structures to Prototype the C2 Process
- Implementing Dynamic Links Between Decision Structures
- Decision Structures In Large Scale Exercises